

AMIETE – ET/CS/IT (New Scheme)

Time: 3 Hours

JUNE 2016

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions, answer any FIVE Questions. Selecting THREE questions from part A and TWO questions from part B.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. In linear programming we need to ensure that both the objective function and the constraints can be expressed as linear expression of _____.
 (A) Objective function (B) Decision variables
 (C) Constraints (D) Basic variables
- b. In Linear programming, both objective functions and constraints can be expressed as _____.
 (A) Linear inequalities (B) Non-linear inequalities
 (C) Linear equalities (D) Non-linear equalities
- c. The feasible region has an important property called the _____ of geometry, provided the feasible solution for the problem exists.
 (A) Non-convexity property (B) Convexity property
 (C) Edge transitive (D) Vertex transitive
- d. While solving a Linear programming problem, the variables assigned the values zero is called _____.
 (A) Basic variables (B) Surplus variables
 (C) Slack variables (D) Non-basic variables
- e. If there are three workers in a construction field all with different ability and three tasks are to be completed, then it is a _____.
 (A) Transportation problem (B) Balanced Assignment problem
 (C) Unbalanced Assignment problem (D) Non-linear programming problem
- f. _____ Phase deals with the formulation of the problem relative to objectives. _____ Phase deals with the formulation of hypothesis and model.
 (A) Judgement, Research (B) Research, Judgement
 (C) Judgement, Action (D) Research, Action
- g. All the values of $\Delta_{ij} = c_{ij} - u_i - v_j$ should be _____ or _____ for the solution to be optimum for a transportation problem.
 (A) Non-zero, Negative (B) Positive, Negative
 (C) Zero, Positive (D) Zero, Negative

h. Match the following sets

Part A

1. PERT
 2. CPM
 3. Events
 4. Activities
- (A) 1a 2b 3c 4d
(C) 1d 2a 3b 4c

Part B

- a. Constructive Project
 - b. R&D work
 - c. Point in time
 - d. Represented by Arrows
- (B) 1b 2a 3c 4d
(D) 1b 2c 3a 4d

i. Travelling salesman problem is defined as

- (A) $x_{ijk} = \infty$ if k^{th} Directed from city i to city k
 (B) $x_{ijk} = 0$ if k^{th} Directed from city i to city j
 (C) $x_{ijk} = -1$ if k^{th} Directed from city j to city k
 (D) $x_{ijk} = 1$ if k^{th} Directed from city i to city j

j. Network scheduling is a technique for _____ and _____ of large projects.

- (A) Scheduling, Integrating (B) Planning, Scheduling
 (C) Integrating, Implementing (D) Planning, Integrating

PART (A)

Answer any **THREE** Questions. Each question carries **16** marks.

Q.2 a. A person wants to decide the constituents of a diet which will fulfil his daily requirements of proteins, fats and carbohydrates at the minimum cost. The choice is to be made from four different types of foods. The yields per units of these foods are given below:

Food type	Yield per unit			Cost per Unit (Rs)
	Proteins	Fats	Carbohydrates	
1	3	2	6	45
2	4	2	4	40
3	8	7	7	85
4	6	5	4	65
Minimum Requirement	800	200	700	

Formulate LP model for the above problem. (8)

b. Solve the following LP problem graphically (8)

Maximize $z = 3x_1 + 4x_2$
 Subject to $x_1 - x_2 \geq 0$
 $2.5x_1 - x_2 \leq -3$
 $x_1, x_2 \geq 0$

Q.3 a. Solve the following LP problem by Simplex method. (12)

Minimize $z = x_1 - 3x_2 + 3x_3$
 Subject to $3x_1 - x_2 + 2x_3 \leq 7$
 $2x_1 + 4x_2 \geq -12$
 $-4x_1 + 3x_2 + 8x_3 \leq 10$
 $x_1, x_2, x_3 \geq 0$

b. Construct the dual to the primal problem (4)

$$\begin{aligned}
 &\text{Maximize} && z = 3x_1 + 5x_2 \\
 &\text{Subject to} && 2x_1 + 6x_2 \leq 50 \\
 &&& 3x_1 + 2x_2 \leq 35 \\
 &&& 5x_1 - 3x_2 \leq 10 \\
 &&& x_2 \leq 20 \\
 &&& x_1 \geq 0, x_2 \geq 0
 \end{aligned}$$

Q.4 a. Solve the following transportation problem by North-West corner method (8)

		Destinations				Supply
		A	B	C	D	
Origins	1	2	3	11	7	6
	2	1	0	6	1	1
	3	5	8	15	9	10
Req.		7	5	3	2	

b. A machine tool company decides to make four subassemblies through four contractors. Each contractor is to receive only one subassembly. The cost of each subassembly is determined by the bids submitted by each contractor shown in the following table in Rupees. (8)

		Contractors			
		1	2	3	4
Subassemblies	1	15	13	14	17
	2	11	12	15	13
	3	13	12	10	11
	4	15	17	14	16

- (i) Write the mathematical model for the problem.
- (ii) Show that assignment model is a special case of the transportation problem.

Q.5 a. Draw a network for the simple project of erection of steel works for a shed. The various activities of the project is under: (8)

Activity	Description	Preceded by
A	Erect Site Workshop	--
B	Fence Site	--
C	Bend Reinforcement	A
D	Dig Foundation	B
E	Fabricate Steel Work	A
F	Install Concrete Pillars	B
G	Place Reinforcement	C, D
H	Concrete Foundation	G, F
I	Erect Steel Work	E
J	Paint Steel Work	H, I
K	Give Finishing Touch	J

b. Write down the distinction between PERT and CPM. (8)

Q.6 a. Consider the game G with the following payoff (8)

		Player B	
		B ₁	B ₂
Player A	A ₁	2	6
	A ₂	-2	λ

- (i) Show that G is strictly determinable, whatever λ may be.
 (ii) Determine the value of G.

b. Reduce the following game by dominance property and solve it. (8)

		Player B				
		1	2	3	4	5
Player A	I	1	3	2	7	4
	II	3	4	1	5	6
	III	6	5	7	6	5
	IV	2	0	6	3	1

PART (B)

Answer any TWO Questions. Each question carries 16 marks.

Q.7 a. Write briefly about the process of Management. (8)

b. Write down Taylor's Four principles of Scientific Management. (8)

Q.8 a. Write short note on importance of Planning. (8)

b. What do you mean by Forecast error? Explain the salient features of (8)

(i) Mean Absolute Error (MAE)

(ii) Mean Squared Error (MSE)

(iii) Forecast Skill (FS)

Q.9 a. Write briefly about financial control. (8)

b. Explain the difference between authority and power. (8)